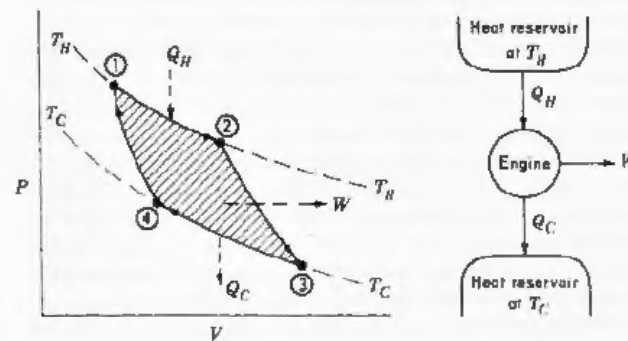


In the figure below the process from state 1 to state 4 and back to 1 can be used to construct a set of thermodynamic arrows of time pointing from state to state.

**THE PROCESS ILLUSTRATED AT THE RIGHT COULD BE REVERSED BY DOING WORK ON THE SYSTEM OR EXTRACTING WORK FROM THE SYSTEM**



**THERMODYNAMIC 'ARROWS OF TIME' CAN BE APPLIED TO THE PROCESS PATHWAYS POINTING FROM INITIAL TO FINAL STATES ALONG THE SYSTEM DIAGRAM AT LEFT**

**NOTE THAT APPLIED ARROWS OF TIME BY AN OBSERVER ARE SCALED USING AN EXTERNAL CLOCK TO QUANTIFY THE TIME SCALE**

**A THERMODYNAMIC ARROW OF TIME DEFINED FOR A PROCESS THAT INVOLVES ENERGY FLOW [Q] AND WORK [W]**

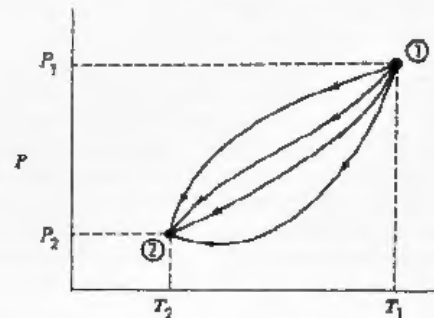
THE THERMODYNAMIC ARROW OF TIME POINTING FROM THE INITIAL (1) TO THE FINAL (2) STATES OF THE SYSTEM

$T$	$P$	$V$	$Q_{rev}$	$W_{rev}$	INITIAL STATE USED TO DEFINE INITIAL TIME
$T_1$	$P_1$	$V_1$	0	0	$t(1)$
$T_2$	$P_2$	$V_2$	$Q_{rev}^f$	$W_{rev}^f$	$t(2)$

\* The superscript  $f$  to  $Q_{rev}$  and  $W_{rev}$  indicates a final value.



**ALL THE THERMODYNAMIC LAWS ARE NOT VIOLATED DURING THE FORWARD PROCESS OR ITS PROCESS REVERSAL**



THE PATHS FROM STATE (1) TO STATE (2) CAN BE USED TO DEFINE PROCESS DEPENDENT THERMODYNAMIC ARROWS OF TIME 'ALONG' THESE PATHS WHEN COMPARED TO A STANDARD CLOCK

In the figure above we see that a thermodynamic arrow of time can be assigned to the process from state 1 to state 2.

**PROCESS REVERSAL IS NOT TIME REVERSAL !!!**